REMARKS

Claims 6 and 9 are pending in the application. Claims 1-5 and 7-8 were previously cancelled. Claims 6 and 9 were amended to correct informalities and to improve their form only. The specification was amended to correct typographical errors. Fig. 9 was amended to correct a typographical error. No new matter was added in amending the claims, specification, and Fig. 9. Support for the amendments of the claims, specification, and Fig. 9, is provided for in the specification. In particular, support for the amendments to the specification are provided for on at least the following pages: page 26, lines 12-26, page 27, lines 1-26, page 28, lines 1-14, and p 35, lines 1-15. Support for the amendment to Fig. 9 is found in the specification at least on at least page 5, lines 15-26, and page 6, lines 1-12. Therefore, no new matter has been added.

For at least the reasons set forth below, withdrawal of all outstanding objections and rejections is respectfully requested.

Amendment to Specification

Amendments have been made in the Specification to correct typographical errors. No new matter has been added.

Amendment to Drawings

Fig. 9 has been amended. The attached replacement drawing sheet containing amended Fig. 9. This Amendment to Fig. 9 replaces reference 159, located on the right of reference 158 and below reference 106, to reference 157. This was an obvious typographical error. No new matter has been added.

Drawing Objections

The Examiner has objected to the drawings because they do not show every feature of the invention specified in the claims. The Examiner stated that "the first winding of the 'drive transformer' is 'connected' to the switching sections must be shown or the feature(s) canceled from the claim(s). Applicants submit that the recited feature is shown in the Figs. and supported in the specification, more particularly, for example as shown in Fig. 7, and described in the specification on pages 49 through 54,

> A transformer 70 has a primary winding 70a, a first secondary winding 70b and a second secondary winding 70c. One end of the primary winding 70a is connected to the connection point of the first switching device 3 and the second switching device 4. The other end of the primary winding 70a is connected to the connection point of the third switching device 5 and the fourth switching device 6. (Page 50, lines 12-20).

Accordingly every feature of the present invention is shown in the figures. Therefore Applicants respectfully request that the Examiner reconsider and withdraw all outstanding objections to the drawings.

Claim Objections

The Examiner has objected to claims 6 and 9 for informalities. The claims were amended to correct the informalities. Support for the amendments is found in the specification and no new matter has been added by the amendments. Accordingly, Applicants respectfully request that the Examiner reconsider and withdraw all outstanding objections to the claims.

35 U.S.C. § 112

Claims 6 and 9 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. Applicants submit that claims 6 and 9, as amended do particularly point out and distinctly claim the subject matter of the present invention. More particularly, the claim as amended, are supported by the specification along with the figures of the present invention. For example, referring to Fig. 7 of the present invention, a first winding of the drive transformer (32, 46) is directly connected to the switching sections (3, 4, 5, 6). In addition, the switching sections (3, 4, 5, 6) short-circuits the primary winding of the transformer (70), as shown in Fig. 8 in (c) and (d); where the drive signal (VG2A) for the second switching device (4) and the drive signal (VG4A) for the fourth switching device (6). The Applicants respectfully request withdrawal of the outstanding claim rejections under 35 U.S.C. § 112, second paragraph.

Prior Art Rejections

Claims 6 and 9 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,130,825 (Imamura et al.).

Claims 6 and 9 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,188,592 (Farrington et al.).

Applicants respectfully traverse these rejections as they relate to the amended set of claims for at least the following reasons set forth below.

1. Imamura et al.

Applicants acknowledge that both Imamura et al. and the present invention disclose a switching power supply having at least two switching sections. However, Imamura et al. does not anticipate the present invention. Nor does Imamura et al. disclose, teach or suggest the present invention. The Examiner refers to Fig. 3, the description of which is present below (underlining added for emphasis):

> Fig. 3 shows another embodiment of the present invention. The same symbols as those shown in Fig. 1 are assigned to the same portions. In this embodiment, to output voltages used for driving MOS transistors Q3 and Q4, an independent third winding, L_3 insulated from a secondary winding is provided. The third winding drives the synchronous-rectifying MOS transistors Q3 and Q4. The MOS transistors Q3 and Q4 are connected to the ground at the sources, and thereby gate driving is made easy (Column 5, lines 25-29, and Column 6, lines 1-4).

As shown in Fig. 3 of Imamura et al. the transformer (t) has a primary winding (L1), a secondary winding (L2) and a third winding (L3). The third winding (L3), which is insulated from the secondary winding (12), drives the synchronous-rectifying MOS transistors (Q3, Q4). The third winding (L3) is energized by the voltage applied to the primary winding (L1), and the voltage of the primary winding is controlled by switching the MOS transistors (Q1, Q2). Applicants respectfully submit that Imamura does not anticipate the configuration of the present invention. In the present invention, referring to Fig. 7, the switching power supply comprises a transformer which has a primary winding (70) and a second transformer (the drive transformers 32, 46) having a different first winding from the transformer which has a primary winding (70). See the following text portions of the present invention (underlining added for emphasis):

> The switching power supply in accordance with Embodiment 2, ..., the input of the first drive transformer 32 can be obtained from the third switching device 5 and the input of the second drive transformer 46 can be obtained from the first switching device 3. (Page 56, lines 22-25)
>
> ...the configuration is such that the gate capacitances of the first synchronous rectifier device 8 and the second synchronous rectifier device 9 can be discharged via the first drive transformer 32 and the second drive transformer 46 into the exciting inductance and the leakage inductance of the transformer 70. (Page 57, lines 7-14).

Imamura et al does not anticipate, teach or suggest that the switching operation of the synchronous rectifier section (8, 9) is performed via the second transformer (32, 46) by the energy stored in transformer (70).

Patentability of independent claim 6 over Imamura et al.

Claim 6 reads as follows (underlining added for emphasis):

> 6. A switching power supply comprising:
> at least two switching sections which have minuscule stop periods and repeat ON/OFF operation to convert an input voltage to an AC voltage;
> a transformer which has a primary winding, to which the AC voltage obtained by the conversion performed by said switching sections is applied, and a secondary winding, and stores exciting energy;
> a synchronous rectifier section for rectifying a voltage induced in the secondary winding of said transformer by switching operation;
> a smoothing section for smoothing the voltage rectified by said synchronous rectifier section to form an output voltage;
> a PWM control circuit which forms a PWM signal for controlling said output voltage to determine an ON/OFF ratio of said switching sections; and
> a drive transformer for ON/OFF-driving said synchronous rectifier section according to said PWM signal or a voltage signal applied to said switching sections, wherein
> a first winding of the drive transformer is directly connected to the switching sections, and
> the switching operation of said synchronous rectifier section is performed via the drive transformer by the energy stored in the transformer which has a primary winding.

Imamura et al. does not disclose or suggest a drive transformer configured to have a first winding directly connected to one or more switching sections where the switching operation of

one or more rectifier sections is performed by the drive transformer from the energy stored in the transformer which has a primary winding. Accordingly Imamura et al inherently cannot disclose or suggest this because it does not exist in Imamura et al. Independent claim 6 distinguishes over Imamura et al. based on the features underlined above. In view of the foregoing, withdrawal of the rejections of independent claim 6 is respectfully requested. The rejected dependent claim 9, is patentable over Imamura et al. whether taken alone or in combination Farrington et al. at least by its depending from the independent claim, for the reasons described above, and because it recites additional patentable features.

Farrington et al.

Applicants acknowledge that both Farrington et al. and the present invention disclose a switching power supply having synchronous rectifier circuit. However, Farrington et al. does not anticipate the present invention. Nor does Farrington et al. disclose, teach or suggest the present invention. The Examiner refers to Fig. 4a, the description of which is present below (underlining added for emphasis):

> Figs 4A and 4C illustrate the implementation of an externally-driven synchronous rectifier circuit for a full bridge topology, denoted generally as 65, and the corresponding voltage waveforms for the conditions where there is a reversal of power flow in a full bridge topology. These conditions may develop with two or more modules in parallel where a very loose current sharing scheme is used during the turn-on phase of a module while another module is already on (or module start-up into a working voltage, hot plug-in). For implementations where the external drive circuit 18 (timing circuit) defines both the turn-on and turn-off times of the synchronous rectifiers SQ1 and SQ2, a typical synchronous rectifier would not be allowed to self-correct and both synchronous rectifiers SQ1 and SQ2 would conduct as soon as the switchers turn off allowing the inductor current to build in the negative direction.

Farrington et al. discloses a self-driven synchronous rectifier circuit(50) having a timing transformer (Tsx), a capacitor (Ctx), and a timing circuitry (18), as an external drive circuit. In Farrington et al. the primary winding of the timing transformer (Tsx) is connected through the timing circuitry to the switching section (Q1, Q2, Q3, Q4). In the present invention, the drive transformer does not connect through a timing circuitry to the switching sections. In the present invention the drive transformer is directly connected to the switching sections. This is not disclosed or suggested in Farrington et al.

Patentability of independent claim 6 over Farrington et al.

Claim 6 reads as follows (underlining added for emphasis):

> 6. A switching power supply comprising:
> at least two switching sections which have minuscule stop periods and repeat ON/OFF operation to convert an input voltage to an AC voltage;
> a transformer which has a primary winding, to which the AC voltage obtained by the conversion performed by said switching sections is applied, and a secondary winding, and stores exciting energy;
> a synchronous rectifier section for rectifying a voltage induced in the secondary winding of said transformer by switching operation;
> a smoothing section for smoothing the voltage rectified by said synchronous rectifier section to form an output voltage;
> a PWM control circuit which forms a PWM signal for controlling said output voltage to determine an ON/OFF ratio of said switching sections; and
> a drive transformer for ON/OFF-driving said synchronous rectifier section according to said PWM signal or a voltage signal applied to said switching sections, wherein
> a first winding of the drive transformer is directly connected to the switching sections, and
> the switching operation of said synchronous rectifier section is performed via the drive transformer by the energy stored in the transformer which has a primary winding.

Farrington et al. does not disclose or suggest a first winding of the drive transformer directly connected to the switching sections. Accordingly, Farrington et al. inherently also cannot disclose the a switching operation of a synchronous rectifier section that is performed by a drive transformer whose first winding is directly connected to the switching sections because it does not exist in Farrington et al. Independent claim 6 distinguishes over Farrington et al. based on the features underlined above. In view of the foregoing, withdrawal of the rejections of independent claim 6 is respectfully requested. The rejected dependent claim 9, is patentable over Farrington et al. whether taken alone or in combination Imamura et al. at least by its depending from the independent claim, for the reasons described above, and because it recites additional patentable features.

Conclusion

Insofar as the Examiner's rejections were fully addressed, the present application including the pending claims, claims 6 and 9, is in condition for allowance. A Notice of Allowability of all pending claims is therefore earnestly solicited.

Respectfully submitted,

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